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**METHOD FOR MANUFACTURING
SOLID-STATE IMAGING ELEMENT,
SOLID-STATE IMAGING ELEMENT,
METHOD FOR MANUFACTURING
ELECTRONIC APPARATUS, AND
ELECTRONIC APPARATUS**

**CROSS-REFERENCE TO RELATED
APPLICATIONS**

This application is a divisional of U.S. application Ser. No. 13/480,959 filed May 25, 2012, which contains subject matter related to that disclosed in Japanese Priority Patent Application JP 2011-142428 filed in the Japan Patent Office on Jun. 28, 2011, the entire contents of both of which are incorporated herein by reference.

BACKGROUND

The present technique relates to a method for manufacturing a solid-state imaging element, a solid-state imaging element, a method for manufacturing electronic apparatus including it, and electronic apparatus.

The solid-state imaging element typified by element of the charge coupled device (CCD) type and element of the complementary metal oxide semiconductor (CMOS) type includes plural pixels disposed in a matrix manner for example and includes color filters and lenses provided corresponding to the respective pixels.

Each pixel configuring the solid-state imaging element has a light receiving part such as a photodiode having a photoelectric conversion function. The color filters provided corresponding to the respective pixels are each a filter part of any color among e.g. red, green, and blue and each transmit light of a component of a respective one of the colors. The lenses provided corresponding to the respective pixels are each provided corresponding to the light receiving part of a respective one of the pixels and each collect incident light from the external onto the corresponding light receiving part. Examples of the lens included in the solid-state imaging element include an on-chip lens provided on the upper side of the color filter (light incident side) and an in-layer lens that is provided inside the layer-laminated structure configuring the respective pixels and collects light transmitted through the color filter.

In such a solid-state imaging element, a phenomenon of so-called color crosstalk often occurs. The color crosstalk refers to a phenomenon in which, at the boundary part between adjacent pixels of colors different from each other, part of light incident on the color filter corresponding to the pixel of one of the colors is incident on the photodiode of the pixel of the other of the colors as oblique light or the like. The color crosstalk often causes unevenness of the sensitivity and image quality in the solid-state imaging element. Problems due to such color crosstalk become more pronounced along with microminiaturization, increase in the number of pixels, and so forth in the solid-state imaging element.

In order to suppress the color crosstalk in the solid-state imaging element, in a related art, a light blocker as a layer or a film having a light blocking function is provided between pixels adjacent to each other. For example, Japanese Patent Laid-open No. 10-163462 (hereinafter, Patent Document 1) discloses a configuration including a metal thin film as a light blocker formed into a grid form in a lattice manner for each unit cell compartment in a solid-state imaging element.

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In the configuration disclosed in Patent Document 1, each inside part of the grid-form metal thin film serves as a segmentalized light receiving part region and a color filter and a microlens are independently provided for each light receiving part region. The grid-form metal thin film exists at the boundary part between adjacent pixels, of the color filters and the microlenses provided corresponding to the respective pixels.

SUMMARY

Certainly, it will be considered that, according to the configuration including the grid-form metal thin film surrounding each light receiving part region in a solid-state imaging element like the configuration of Patent Document 1, each light receiving part region is surrounded in a cylindrical manner by the metal thin film and the light collection efficiency is enhanced to allow achievement of enhancement in the sensitivity and suppression of color crosstalk.

However, in the related-art solid-state imaging element like that disclosed in Patent Document 1, the light blocker provided between adjacent pixels is formed by patterning. Therefore, pattern misalignment between the lens provided corresponding to the light receiving part of the pixel and the light blocker located between adjacent pixels easily occurs and the accuracy of pattern alignment between the lens and the light blocker is low. Unless the accuracy of pattern alignment between the lens and the light blocker is sufficiently ensured, it is difficult to respond to microminiaturization and increase in the number of pixels in the solid-state imaging element.

There is a need for the present technique to provide a method for manufacturing a solid-state imaging element, a solid-state imaging element, a method for manufacturing electronic apparatus, and electronic apparatus that each have the following advantages. Specifically, in providing a light blocker at the boundary part between lenses provided corresponding to the light receiving parts of the respective pixels, the light blocker can be formed in a self-aligned manner. Thus, the accuracy of pattern alignment between the lens and the light blocker can be enhanced and it is possible to easily respond to microminiaturization and increase in the number of pixels.

According to an embodiment of the present technique, there is provided a method for manufacturing a solid-state imaging element. The method includes forming lenses that are each provided corresponding to a light receiving part of a respective one of a plurality of pixels arranged in an imaging area over a semiconductor substrate and collect light onto the light receiving parts, and forming a light blocking layer by performing film deposition on the lenses by using a material having light blocking capability. The method further includes forming a light blocker composed of the material having light blocking capability at a boundary part between the lenses adjacent to each other by etching the light blocking layer in such a manner that the material having light blocking capability is left at the boundary part between the lenses.

According to another embodiment of the present technique, there is provided a solid-state imaging element including a plurality of pixels configured to be arranged in an imaging area over a semiconductor substrate and each have a light receiving part that accumulates a signal charge obtained by photoelectric conversion of incident light, and color filters configured to be each provided for a respective one of the plurality of pixels. The solid-state imaging